GNSS and its development within the tolling domain

27th May 2014

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European GNSS Agency (GSA)

European Global Navigation Satellite Systems Agency

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The European GNSS Agency (GSA)

- Staff: **111**
- Nationalities: **18**
- Headquarters: **Prague**

The European GNSS Agency mission is to exploit the EGNOS and Galileo system

- to the full benefit of users in the European Union,
- to maintain the system and services in the most cost-efficient manner,
- to promote the development of applications and value added-services towards defined user segments.

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Among GNSS market segments and applications, today we focus on RUC

Aviation	Road	Maritime	Agriculture	Surveying	LBS	Rail
-Approaches with vertical guidance (SBAS APV) -Advances procedures for approach and landing	**-Navigation** **-RUC** **-eCall** **-ITS** **-Logistics** **-ADAS**	-Port approach -Coastal navigation -Open sea navigation -Inland waterways navigation	-Tractor guidance -Automatic steering -Variable Rate Technology -Asset monitoring	-Cadastral surveying -Construction surveying -Mapping	-Location based applications -Weather info, gaming, social media, advertising -Personal navigation	-Logistics -Asset management -Passenger information services -Driver assistance

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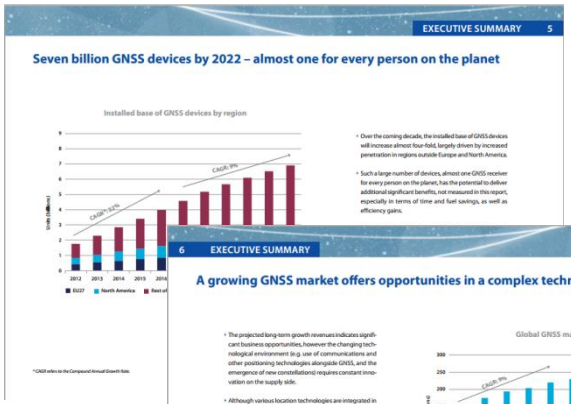
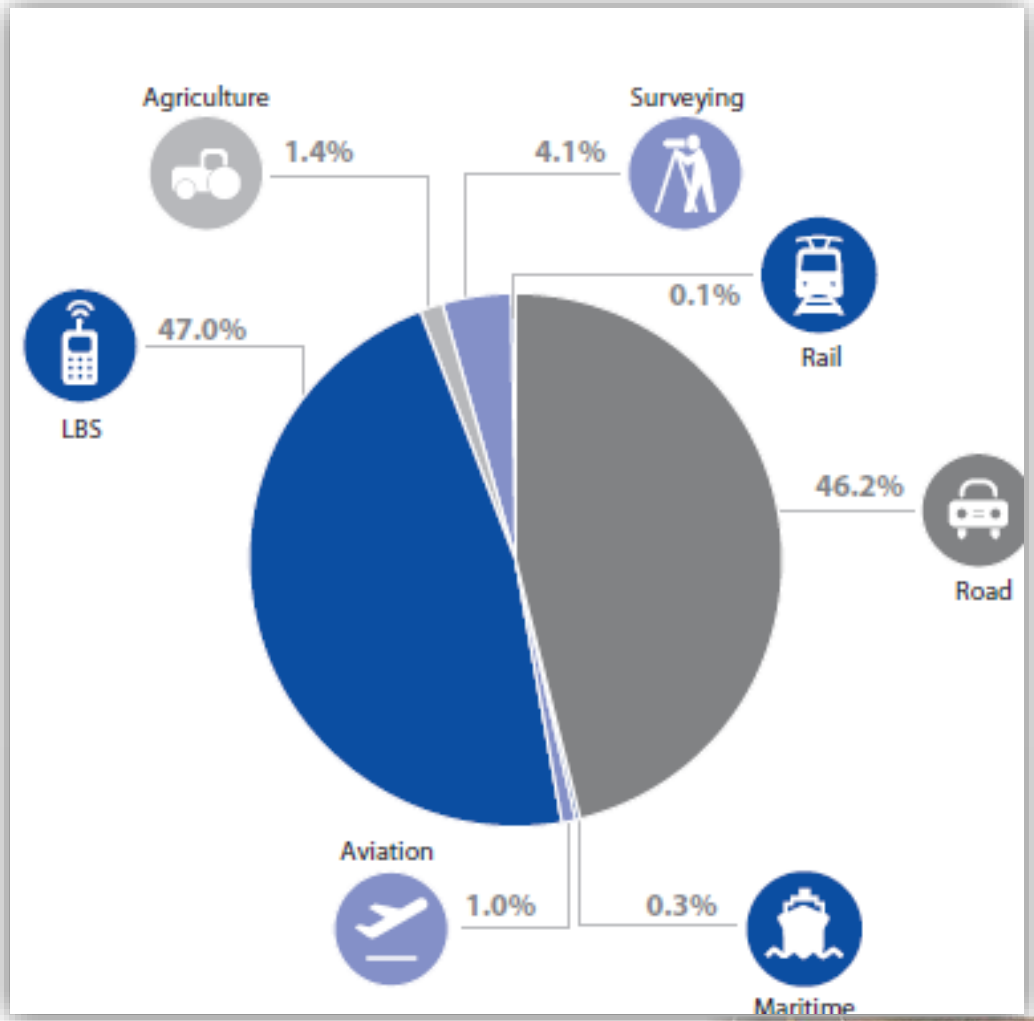
Road is the largest GNSS market segment together with Location based services (LBS)





Source: http://www.gsa.europa.eu/sites/default/files/GNSS_Market%20Report_2013_web.pdf

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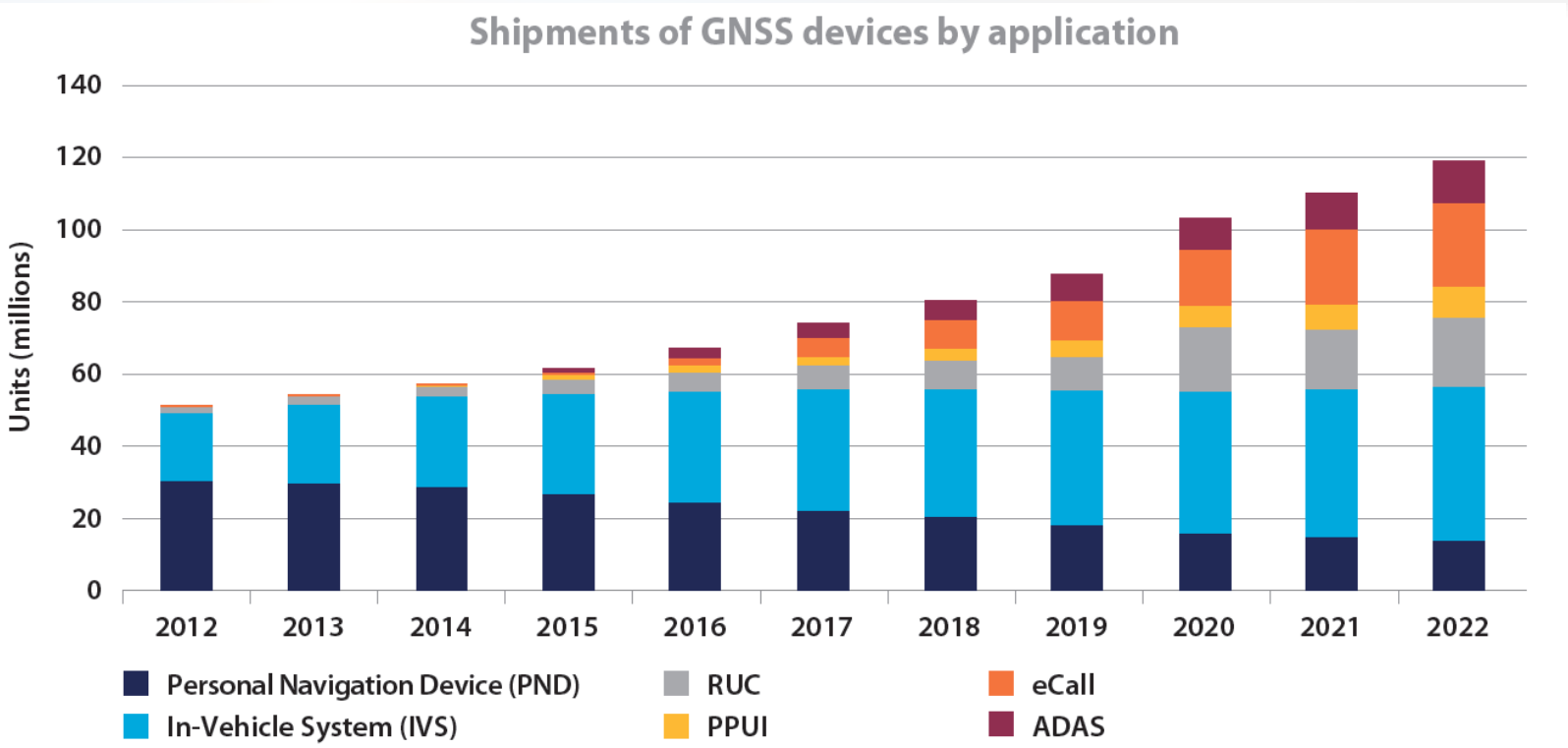
Current status of the GNSS adoption in Road



- The shipments and installed base of GNSS devices are expected to grow constantly and dynamicaly in the next decade in all the regions of the world.
- Shipments of **GNSS devices for RUC will grow yearly around 30% by average until 2022**

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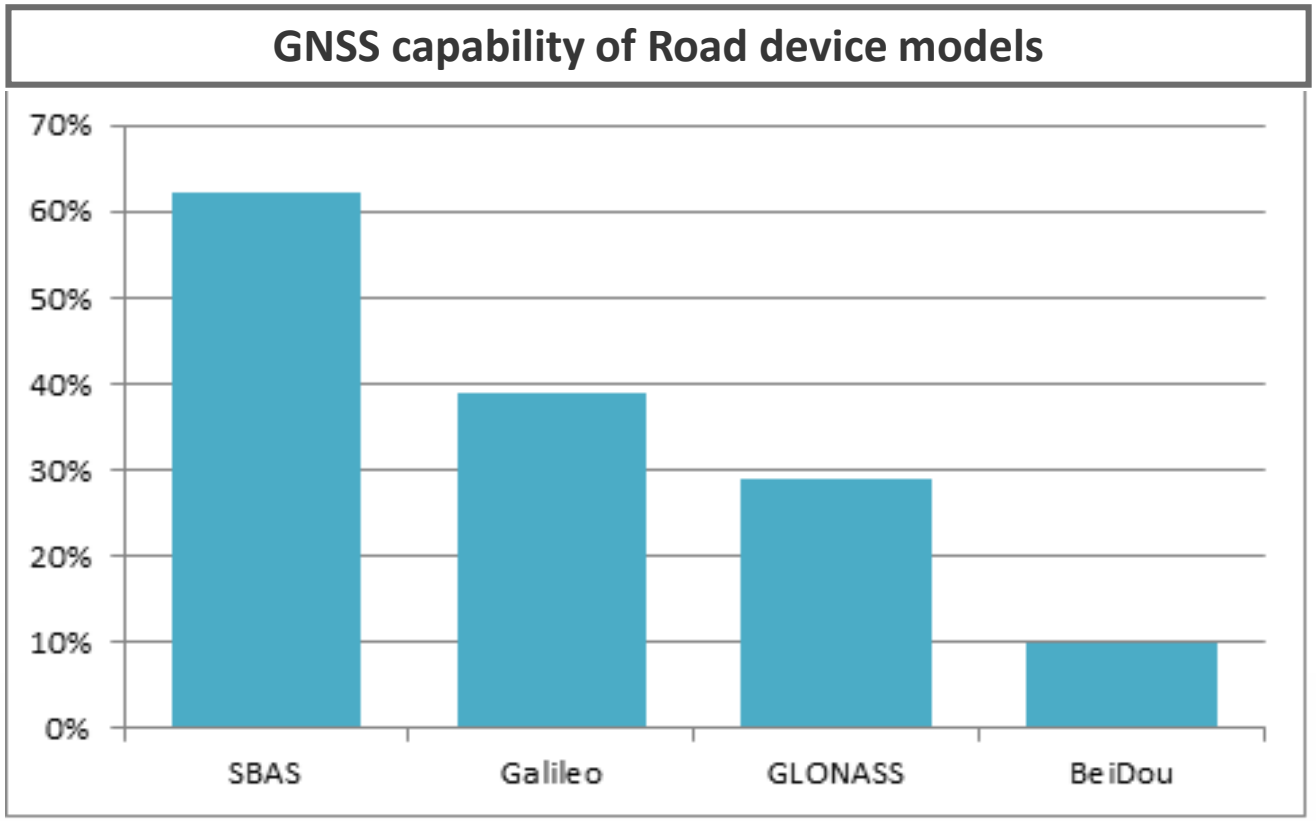
GNSS Receiver manufacturers understand the benefits of multiconstellation



Source: GPS World receiver survey 2013

- The majority of **GNSS chipset and receiver** manufacturers in the ITS/Road are ready to launch Galileo ready products

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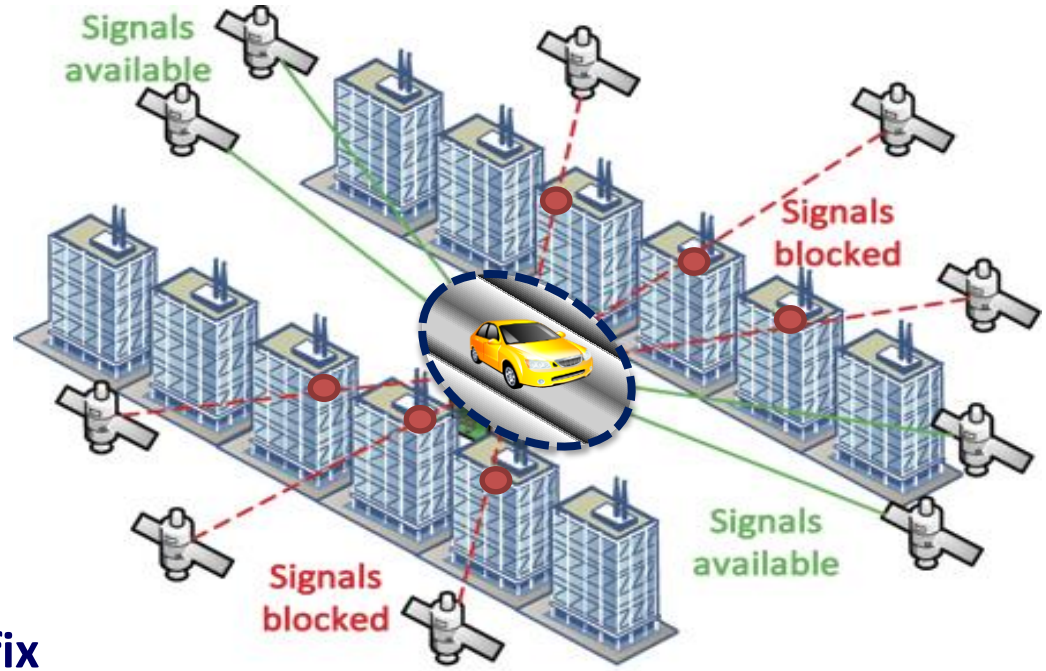
Why multiple GNSS?

✓ When buildings block the signal and reduce the number of visible satellites, the availability of more constellations ensures a **much more accurate final position**



✓ Having more satellites in view has beneficial effect on **reducing the time to the first fix**

✓ The **robustness of the position is improved**, and even if a satellite or constellation are not available or providing incorrect data, a reasonable accuracy will continue to provided.

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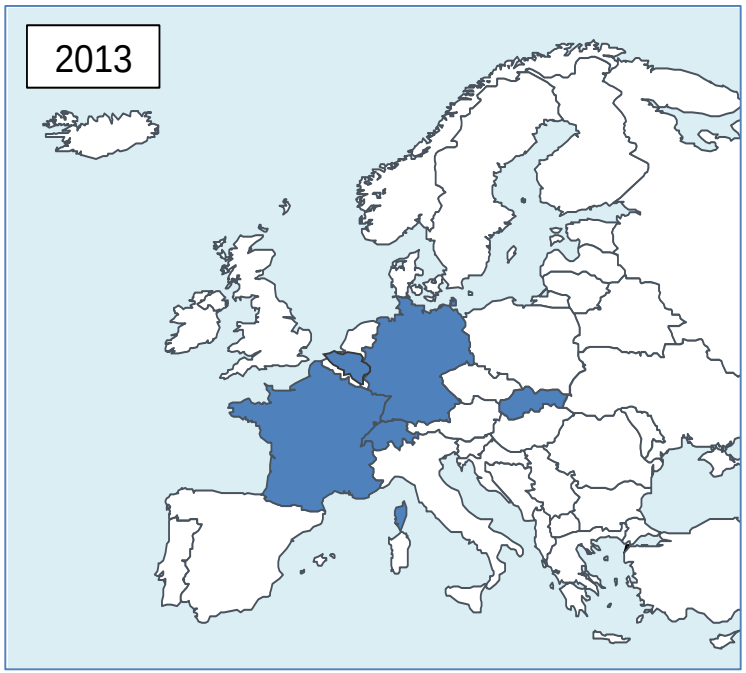
Main benefits of GNSS-based RUC

- **Flexibility:** it can be used to charge a road user according to different principles (time, distance, place, vehicle type, level of emissions) and change in line with evolving needs
- **Extensibility**: new sections simpler to implement as it affects to back office
- **Low transaction costs**: it can be considered as a cost-effective solution in large and complex new networks, involving different vehicle categories
- **Revenue potential:** OBUs could be used as a platform for more applications (e.g. fleet management, real time traffic information, etc.)
- **Traffic management**: Policy-makers and road infrastructure operators might exploit the data, aggregated and made anonymous, to improve policies
- **Environment**: no road-side infrastructures minimize the environmental impact

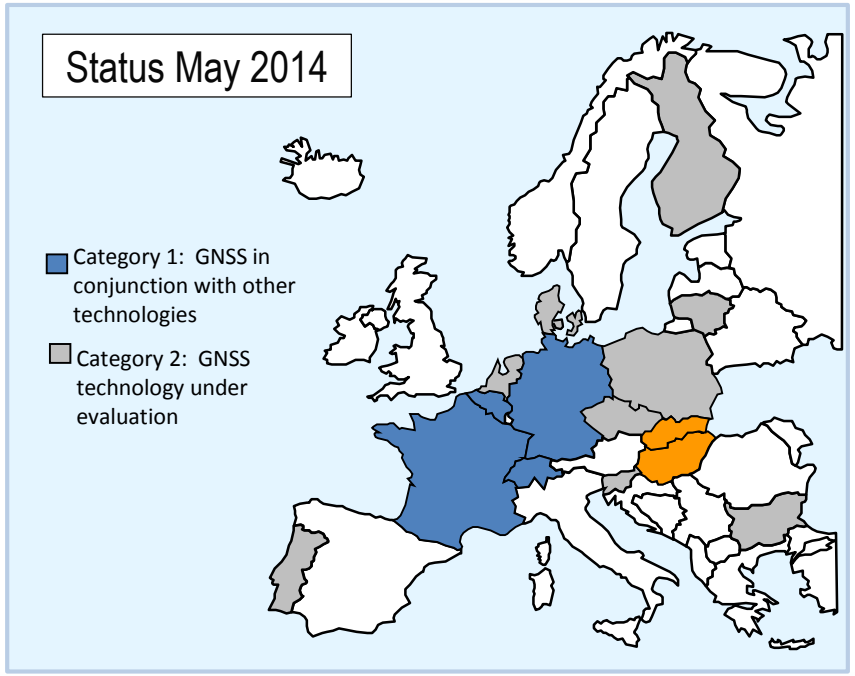
European GNSS take-off in RUC

1st GENERATION GNSS-RUC



- Germany the first to implement a RUC system solely based on GNSS
- French écotaxe project designed a DSRC-interoperable tolling system

2nd GENERATION GNSS-RUC



- Multi-constellation:
  - ✓ Accuracy
  - ✓ Availability
  - ✓ Integrity
  - ✓ Signal authentication (Galileo)

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The Hungarian scheme was able to exploit GNSS advantages to reach a great success …

- Only **6 months** from withdrawal of Getronics to the official start of HU-GO operations (2,5 month implementation time!)

- **6.501 kms of tolled roads** (motorways, highways, main routes)

- C. 424 €m of tolls in first 10 months versus c. **75€m of investment**
- C. 40% from OBUs

- Already **129.700 registered vehicles** (>3.5 tonnes) in the **first 10 months** …

- … with c. 69.300 OBUs

Would it have been possible without GNSS?

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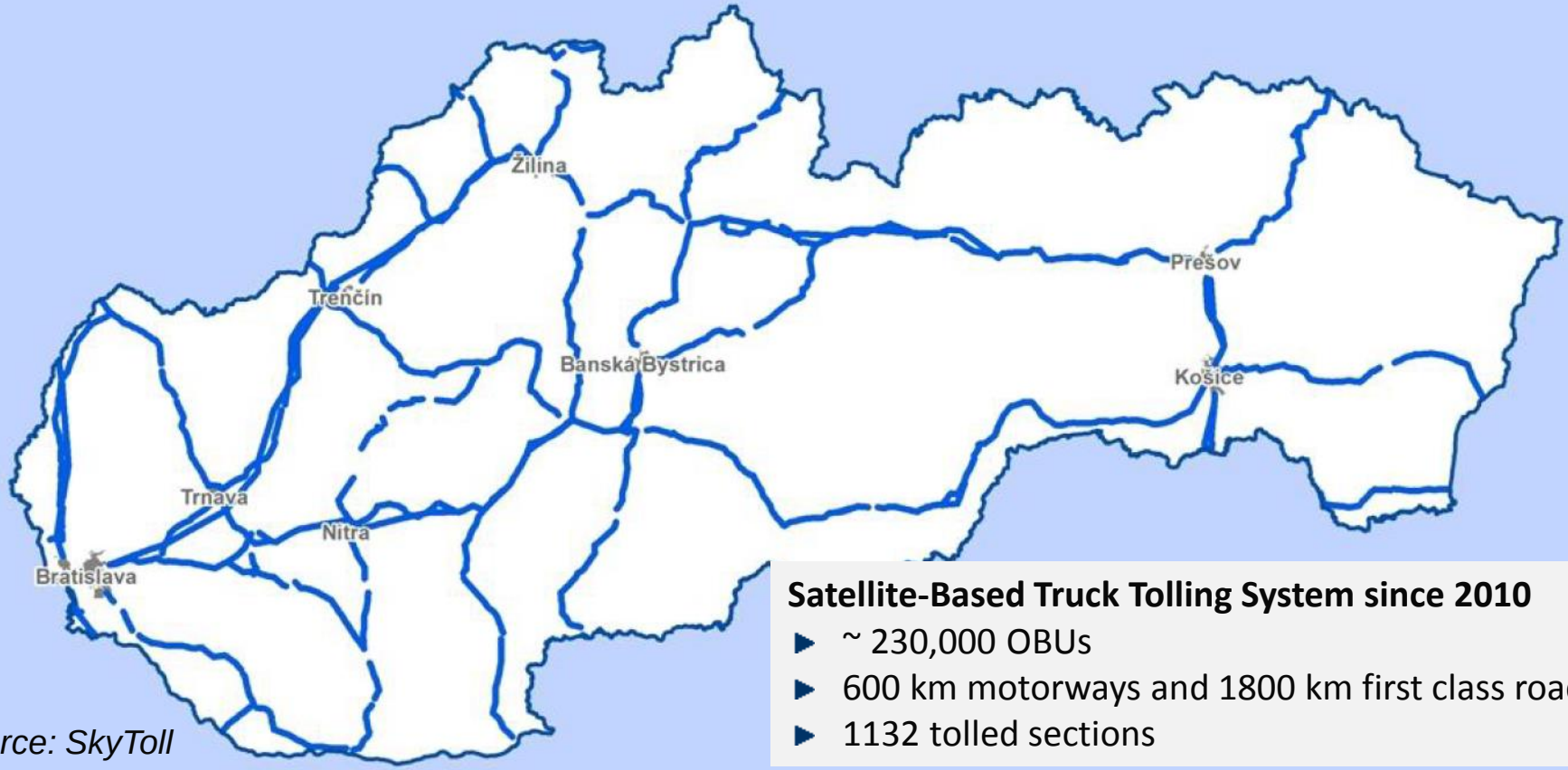
… however several features powered by European GNSS are yet to be exploited

- GSA organised a dedicated workshop for **50 experts from Toll Declaration Operators and public authorities representatives** on the 9th May jointly with the National Toll Payment Services of Hungary

- The added value of EGNOS and Galileo was stressed in order to **enhance the current GPS-based eToll solution in a more robust and reliable way:**

  - ✓ Identification of position in parallel lanes
  - ✓ Better position in urban canyons/ under tree canopies
  - ✓ Improved Time to First Fix
  - ✓ Robustness of GNSS-based charging against spoofing attempts

SLOVAKIA: The Tolled Network from 2010 to 2013



Source: SkyToll

Satellite-Based Truck Tolling System since 2010

- ~ 230,000 OBUs
- 600 km motorways and 1800 km first class roads
- 1132 tolled sections

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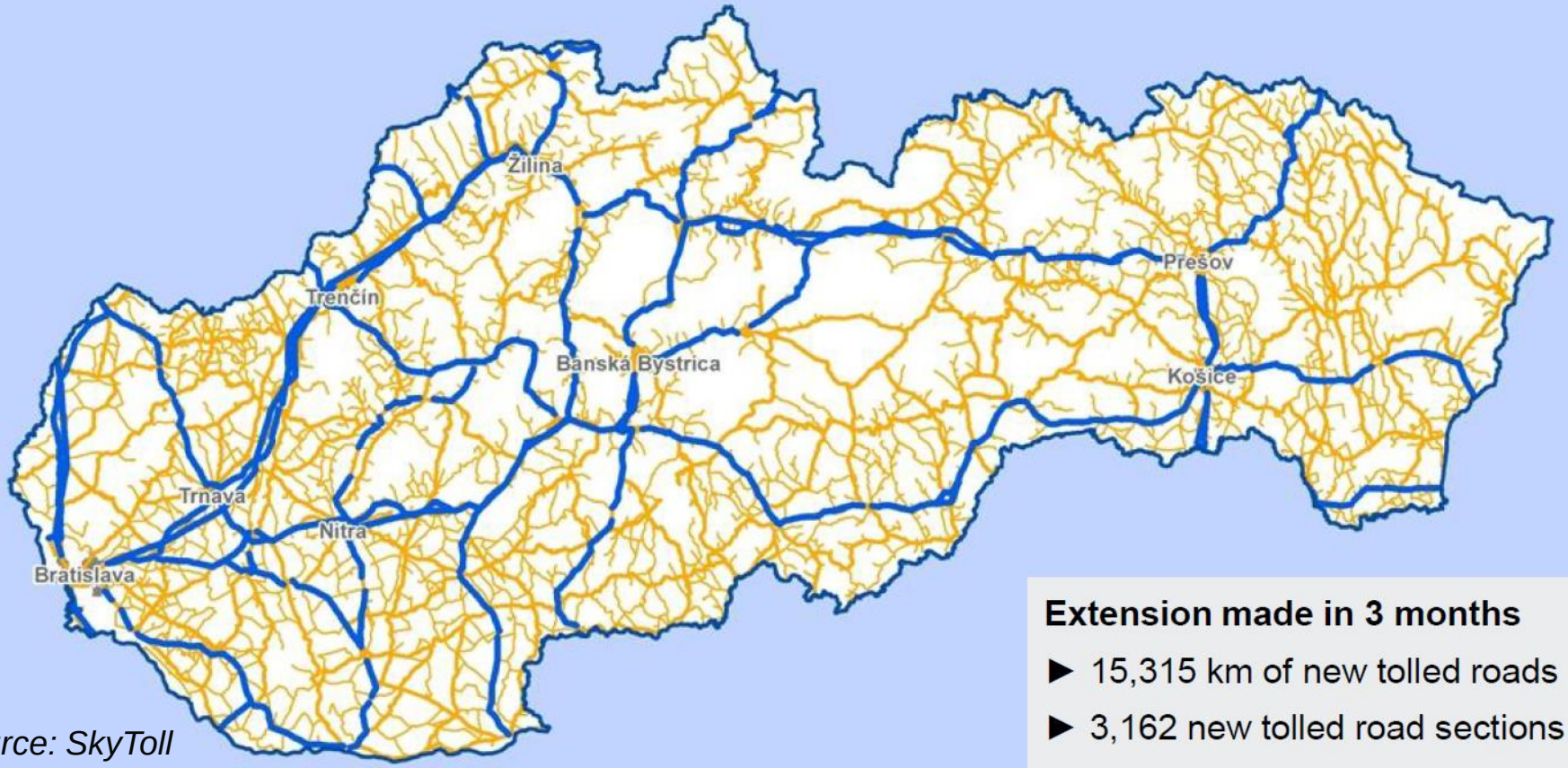
2014: Rapid Extension in Slovakia using GNSS



Extension made in 3 months

- ► 15,315 km of new tolled roads
- ► 3,162 new tolled road sections

Source: SkyToll

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Conclusions

- GNSS is becoming the **technology of choice** for new free-flow tolling systems

Thee main advantages for tolling operators:
coverage, availability and no direct installation costs

- **GNSS-hybrid solutions** from existing DSRC technologies can offer advantages to toll chargers

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Thanks

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